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Crop Profile for Cactus Pear in California

Prepared: August, 2000

General Production Information

- Cactus is a minor crop in the U.S. with approximately 600 acres produced annually in California (2).
- Cactus is also produced in Texas (2).
- California produces approximately 70-80% of the Cactus fruit grown in the U.S. (2).
- Monterey is the top Cactus producing county in California with 400-450 acres having a value of approximately \$2,000,000.00 in 1998. (2).
- The cost to produce (i.e., grow) a carton of Cactus weighing in the range of 14 to 18 pounds and containing 40 to 70 Cactus fruit ranges from \$5.00 to \$6.50 per carton (2).
- The cost to harvest (i.e., harvest and handling) a carton of Cactus containing 40 to 70 Cactus fruit ranges from \$3.00 to \$4.00 per carton (2).

PRODUCTION REGIONS

Cactus are primarily produced in Monterey County (2).

Cultural Practices

GENERAL INFORMATION

Cactus is grown on a number of soil types. Producers of Cactus either own and/or lease land for production to ensure adequate acreage to meet their marketing requirements.

CULTIVAR DEVELOPMENT

D'Arrigo conducts their own breeding program and develops Cactus types for their own use. Specific

Cactus types planted at the proper time, and in the proper location, ensure that desirable characteristics will be maximized and undesirable characteristics will be minimized.

PLANTING

Cactus is reproduced vegetatively and Cactus cladodes (pads) are planted by the grower at depths of approximately 8 to 12 inches. Cactus are grown on the flat with approximately 120 to 220 Cactus plants per acre.

PRODUCTION

Growers are primarily responsible for all production related activities including land preparation, cultivation, fertilization, irrigation, and the use of pesticides. Most commercial plantings of Cactus are produced under drip irrigation. The major production region in California is in Monterey County. It takes approximately 3 years to reach commercial fruit production, and individual Cactus plants remain productive for 10 to 15 years.

HARVEST

Cactus fruit (tuna)- The normal harvest period for fruit on mature Cactus plants ranges from September through March, with an approximate period of 30 to 45 days during which there are no flowers or fruit present. In California, Cactus is harvested by hand cutting of the fruit. The cut fruit are placed in bulk bins and delivered to a packing facility. At the facility, the Cactus spines are mechanically removed and the fruit placed into fiberboard cartons. There are 40, 50, 60, or 70 Cactus fruit per carton, and the average weight of a carton ranges from 14 to 18 pounds.

All Cactus fruit is harvested in the field and not subject to washing at the time of harvest. After spine removal, all Cactus is cooled, usually within 24 to 72 hours after harvesting.

Cactus fruit are shipped to the market in refrigerated trucks and temperatures in the range of 40 to 44 degrees F are maintained during shipment. Cactus fruit can be damaged under low temperature conditions (e.g., <36 degrees F).

Cactus pads(cladodes), sometimes referred to as nopalitos, are usually harvested as tender immature cladodes. Cactus pads are cut from the plants and utilized soon after harvest, as they do not store well.

PEST MANAGEMENT

All applications of pesticides in California are under the control of the growers, and/or their Pest Control Advisor (PCA), or Pest Control Operator (PCO). Growers, PCA's, and PCO's work closely to insure that only registered pesticides are used and that they are used in compliance with all state and federal laws, rules and regulations, and labeled recommendations. Communication between growers, PCA's, and PCO's is maintained during the planting and production periods through frequent field visitations by grower representatives and/or their PCA's. The applicator must inform all affected parties in close proximity to the intended treated area (e.g., harvesting crews, weeding crews, irrigators etc.) of their

intent to apply pesticides in advance of the application and must also post fields and file post-application paperwork with the appropriate state and/or federal agency. Closed systems are also mandatory for the application of Category 1 pesticides in California.

All information on pests and pesticides listed in this report relate to the production of Cactus in California. All pests and pesticides mentioned in this report are listed in alphabetical order, and each such listing may, or may not, have any relationship to the importance of the pest or the use of an individual pesticide. Listing of percentage of acres treated for any material represents the total use of that individual pesticide as determined by the California Department of Pesticide Regulation (3). When the same material is used on more than one pest (e.g., scale and lepidopterous larvae), the percentage of acres treated is the total for the state and each such use is not additive.

Data on individual pesticide use, as taken from the California Department of Pesticide Regulation (3), is presented in the text for 1998.

Insect Pests

There are only a limited number of pests that damage Cactus. European earwigs are the predominant pest that damage Cactus pads following planting and during the development of new growth. Cochineal scale are the primary pests of mature Cactus plants, while the cabbage looper is an occasional problem. Snails are the only other pest of significance, and can cause major damage to developing Cactus fruit and pads if not controlled. There are only a limited number of pesticides registered for use on Cactus.

Cabbage Looper (*Trichoplusia ni*): This insect is an occasional problem in the spring of the year and can cause serious damage to developing Cactus pads. The primary materials used for this pest are *Bacillus thuringiensis* and carbaryl with none to 1 total treatments applied on an annual basis.

CONTROLS

Biological

Parasites that feed on lepidopterous looper eggs or larvae include the following: parasitic wasp (*Trichogramma* spp.; tachinid fly (*Voria ruralis*); and other wasps (*Copidosoma truncatellum*, *Hyposter exiguae*, and *Microplitis brassicae*) - (5).

Predators also play a role in reducing populations of lepidopterous larvae. Two predators that feed on lepidopterous eggs are minute pirate bugs (*Orius* spp.), and bigeyed bugs (*Geocoris* spp.) - (5).

Parasites and predators may assist in reducing lepidopterous egg and/or larval populations.

However, there are no economic biological controls for cabbage looper on Cactus.

Chemical

Bacillus thuringiensis (BT) - Labeled PHI is 0 days. BTs usually require additional applications to be effective, and some pad damage may occur from feeding while worms are ingesting toxic amounts of BT type products. There were no BTs applied to Cactus in 1998 (3).

Carbaryl - Labeled PHI is 1 day. Typical PHI ranges from 7 to 21 days (2, 4). Carbaryl is applied as foliar spray at a typical rate of 2.0 lbs. ai. per acre, and when applied for scale control will suppress populations of the cabbage looper (2, 4). Carbaryl was applied to approximately 62% of the Cactus acres in 1998 (3).

European earwig (*Forficula auricularia*): Earwigs are primarily a problem following planting of Cactus pads in new groves and on newly developing pads on mature plants. Earwigs feed on young developing pads after planting and can kill pads or delay their development from their feeding. They also feed on newly developing pads on mature plants and can cause reduced yields by impacting the development of fruit buds. The only registered material available for this pest is carbaryl with 1 application of bait made to most new plantings and 1 to 2 foliar treatments applied to mature plants on an annual basis.

CONTROLS

Biological

There are no available biological controls for earwigs on Cactus.

Chemical

Carbaryl - Labeled PHI is 1 day. Typical PHI ranges from 7 to 21 days (2, 4). Carbaryl is available as a bait under EPA SLN NO. CA-960009 for earwig control. It is applied as a bait treatment after planting at a typical rate of 2.0 lbs. ai. per acre, or as foliar spray at a typical rate of 2.0 lbs. ai. per acre (2, 4). Carbaryl was applied to approximately 62% of the Cactus acres in 1998 (3).

Cochineal scale (*Dactylopius coccus*): Scale develop on the pads of young or mature Cactus plants and can reduce plant vigor and subsequent yield if not controlled. The only registered material available for this pest is carbaryl with 1 to 2 foliar treatments applied to mature plants on an annual basis.

CONTROLS

Biological

There are no available biological controls for scale on Cactus.

Chemical

Carbaryl - Labeled PHI is 1 day. Typical PHI ranges from 7 to 21 days (2, 4). Carbaryl is applied as foliar spray at a typical rate of 2.0 lbs. ai. per acre (2, 4). Carbaryl was applied to approximately 62% of the Cactus acres in 1998 (3).

Weeds

Although weed management is critical in the production of Cactus, there are no currently registered herbicides available for use on this crop.

If not controlled, weeds increase the cost of production due to increases in the time required for their removal. Individual species (e.g., barnyardgrass, field bindweed, johnsongrass, little mallow, and yellow nutsedge) can interfere with harvest.

CONTROLS

Biological

There are no current methods of providing biological control for either annual or perennial weeds that infest Cactus.

Cultural

Mechanical cultivation and hand hoeing are the only current methods available to eliminate weeds in Cactus. Hand hoeing is expensive under high weed populations (2).

Chemical

D'Arrigo, in cooperation with the IR-4, has attempted to register the herbicide diuron for the control of weeds in Cactus. This effort has been ongoing for over ten (10) years. Even though no residues have been detected at twice the proposed use rate, the Environmental Protection Agency (EPA) has refused to grant a tolerance for this use.

Current efforts by D'Arrigo, in cooperation with the IR-4, are aimed at the registration of glyphosate as a spot treatment for weed control in Cactus.

Vertebrate Pests

SNAILS

Brown Garden Snail (*Helix tortensis*): Snails can cause extensive damage to developing Cactus fruit if not controlled. They live primarily in the trash at the base of Cactus plants and crawl up the plants to feed on the developing pads and fruit. The only registered material available for this pest is metaldehyde bait with 2 to 4 treatments applied around the base of mature plants on an annual basis.

CONTROLS

Biological

The Decollate Snail (*Rumina decollata*) is a predator of the Brown Garden Snail but does not provide economic control in Cactus (2).

Chemical

Metaldehyde - Labeled PHI is 0 days. Typical PHI ranges from 7 to 21 days (2, 4). Metaldehyde is applied as a bait (i.e., pellet) treatment at a typical rate of 1.6 lbs. ai. per acre (2, 4). Metaldehyde was applied to approximately 60% of the Cactus acres in 1998 (3).

BIRDS

Birds can cause damage to mature Cactus fruit.

CONTROLS

There are no registered materials that will control birds on Cactus.

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2. Personal Communication - D'Arrigo Brothers Company of California.
3. California Department of Pesticide Regulation - Pesticide Use Reports - 1998.
4. Personal Communication - D'Arrigo Brothers Company of California and/or their PCA's.
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Profile Created July 20, 2000

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